EXHIBIT 9

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF TRANSPORTATION
MASSACHUSETTS HIGHWAY DEPARTMENT

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The documents herein referenced, as they appear today on the Massachusetts Highway Department web site and which include with particularity the cover page of the Commonwealth of Massachusetts Highway Design Manual Massachusetts Highway Department Metric Edition 1997 along with Chapter 1, Highway Design Process, 1.1 Introduction and Chapter 9, 9.3 Roadside Barriers, are the true documents that were in effect on January 4, 2002.

Certified: _____, April 12, 2007
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The Commonwealth of Massachusetts

Highway Design Manual

Massachusetts Highway Department

MASS HIGHWAY

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CHAPTER 1
HIGHWAY DESIGN PROCESS

1.1 INTRODUCTION

One of the most important production activities in the Massachusetts Highway Department (MHD) is to plan, develop, and design to the construction stage, projects for which the MHD is responsible. Not only is this process important from the perspective of production, but public perception of the Department is also heavily influenced by the effectiveness of this process and the sensitivity shown to public concerns. This chapter specifies the process used to develop highway design construction projects in Massachusetts. The process is applicable to all highway construction plans developed by MHD, consultants or municipal personnel and to all projects which are funded with federal, state and/or municipal funds.

Highway design can be a very complicated process with different projects requiring different combinations of personnel and skills. The design process outlined in this chapter has been condensed and simplified for the sake of presentation. The chapter begins by presenting a brief overview of the MHD highway design process. Second, each activity in this process is described with reference given to other sections of the manual for more in-depth discussion. The final section of this chapter provides copies of the 25%, 75%, and 100% highway design submission guidelines. Where applicable, other design publications and documents approved by the MHD for use in certain circumstances are identified.

1.2 STEPS IN THE HIGHWAY DESIGN PROCESS

The flow chart in Figure 1-1 shows the major steps in developing a project from planning to construction. These steps, sometimes referred to as the "project pipeline," describe the important activities that, in most cases, must occur. However, in some instances, projects do not have to follow each step.

As seen in the flow chart, the highway design process consists of four major steps: planning, project development and the 25% design phase; 75% design phase; and 100% design phase. Important characteristics of each step are:

Planning - The Department Bureau of Transportation Planning and Development (BTP&D) is responsible for coordinating all transportation planning activities in the Commonwealth. Important project needs are often identified in each of the planning regions which are then submitted to the Department for initiation. The Executive Office of Transportation and Construction is responsible for coordinating transportation policy of all state transportation agencies and in this role often initiates projects. Major sources of project ideas include MHD District Offices, state legislators, local officials and citizen groups.

9.2.1 Definitions

CLEAR ZONE: The distance required to recover control of, or stop, an errant vehicle leaving the traveled way. This distance is measured from the edge of the travel lane nearest the recovery area, and is based on the traffic volume, the speed of the vehicle and the steepness of the recoverable slopes within the recovery area. Often the clear zone will be the same as the recovery area.

RECOVERABLE SLOPES: A roadway side slope of 1v:4h or flatter.

TRAVERSABLE NON-RECOVERABLE SLOPES: A roadway side slope steeper than 1v:4h but flatter than 1v:4h.

NON-TRAVERSABLE SLOPES: A roadway side slope 1v:3h or steeper. On these slopes the errant vehicle is likely to overturn. These slopes are by definition non-traversable and non-recoverable.

The Designer should use engineering judgement in applying the recommended clear zone distances. Obstacles located within the recovery area should be removed, relocated, redesigned or shielded by traffic barriers or crash cushions. If signs, lighting and/or traffic signals are required within the recovery area, breakaway posts should be used or safety treatments must be provided.

The designer should consult the *Roadside Design Guide* for further information on recovery areas.

9.3 ROADSIDE BARRIERS

A roadside barrier is a longitudinal barrier used to shield motorists from natural or man-made obstacles located along either side of a roadway. It may occasionally be used to protect pedestrians and bicyclists from vehicular traffic. Single-faced longitudinal barrier installed either in the median or on the outside of the roadway is a "Roadside Barrier". Double-faced longitudinal barrier which is designed to redirect vehicles striking either side of the barrier is "Median Barrier". See Section 9.4 for Median Barrier criteria.

The primary purpose of all roadside barriers is to prevent a vehicle from leaving the roadway and striking a fixed object or terrain feature that is considered more objectionable

than the barrier itself. This is accomplished by containing and redirecting the impacting vehicle.

Roadside recovery areas as discussed in Section 9.2 should be provided wherever possible. Where this is not feasible or practical, roadside barriers must be considered.

Roadside barriers are usually categorized as flexible, semi-rigid, or rigid, depending on their deflection characteristics on impact. Flexible systems are generally more forgiving than the other categories since much of the impact energy is dissipated by the deflection of the barrier and lower impact forces are imposed upon the vehicle.

Rigid systems are generally more effective in performance and relatively low in cost when considering their maintenance-free characteristics.

9.3.1 Roadside Barrier Systems

Once it has been decided that a roadside barrier is warranted, the designer must chose the appropriate type of barrier. This choice is based on a number of factors including performance criteria, cost (construction and maintenance), and aesthetics. Table 9.2 summarizes the factors that should be considered. The Roadside Design Guide should be consulted for more information.